
Lighting: Recessed Lighting

Description

This change requires that recessed luminaires located in ceilings be designed to be air tight and rated, so that insulation can be in direct contact with the housing. The lighting industry produces a class of luminaire housings called ICAT (insulation contact air tight) that meet this requirement. Furthermore, if luminaires are incandescent, they must be rated for 75 Watts or less. The following is preliminary language to be included in §150(k).

§150 (k)

Recessed luminaires installed in residences shall meet the following requirements:

- 1. Shall be rated for "insulated ceiling air tight (ICAT)".*
- 2. If equipped with an Edison or screw base, shall have an aperture not larger than 5" and shall be rated for 75 Watts or less.*

This measure would ensure that:

1. Ordinary 6" low cost, incandescent recessed "can" lights, rated up to 150 watts ICAT, would be eliminated from the marketplace, preventing socket wattage from exceeding 75 Watts. Builders would be encouraged to employ the most energy efficient halogen PAR20 and PAR30 lamps instead of inefficient R30 and R40 lamps, reducing typical socket Watts by at least 25 Watts. Or alternatively, the contractor might employ low voltage lighting, which also employs lamps of 75 Watts or less.
 - a. Most lighting installed in homes uses R lamps. The 75PAR30 produces as much effective illumination as a 6" can with a 100-120 Watt R lamp. There will be no need to add more cans.
 - b. The low voltage and compact fluorescent options are viable choices for individual homeowners, architects and designers.
2. For situations demanding more light from recessed "can" lights, usually in kitchens, builders would be encouraged to employ compact fluorescent "can" lights, which tend to be more expensive on a unit basis than tungsten luminaires, but competitive to employing additional 5" tungsten can lights, once labor and wiring costs are considered.

Benefits

This requirement would reduce heat losses through residential ceilings and also reduce lighting energy. Heat loss reductions would result in lowered heating and cooling energy and may also affect the efficiency of HVAC ducts. The change will save at least 25 Watts per recessed "can" light in conventional residential lighting.

Environmental Impact

The environmental impacts of this requirement are positive, including the increased use of fluorescent lighting in residences, which can increase mercury use. However, local increases of mercury are outweighed by the benefit of reductions in air-born mercury at power plants.

Type of Change

This change would be implemented as a mandatory measure in §130 (hotel/motels) and §150 (low rise residential). The Residential and Nonresidential Manuals should be updated to explain the requirement. It would also be beneficial for the Commission to develop and disseminate a fact sheet to all electrical manufacturers and distributors, prior to implementing the measure.

Measure Availability and Cost

All major manufacturers of recessed lighting in the U.S. produce, or could easily produce, products to meet this requirement. Prices, availability, and selection of current products (e.g. Halo H5 family) are consistent with, and to some degree cost less, than the 6" family equivalents. Including trim, costs for builder-grade ICAT can lights are presently about \$25 per luminaire more expensive than the non-ICAT lights.

PNNL is presently funding the development of residential-grade, compact fluorescent luminaires that meet these requirements. It is strongly believed that a reasonably-priced, ICAT dimmable downlight can be produced using offshore manufacturing to cost within \$25 of the current tungsten equivalent (about \$75).

Useful Life, Persistence and Maintenance

This requirement will result in lighting systems that will persist, cannot be easily circumvented, provide reasonable aesthetics and choice, generally enjoy longer lamp life than the base case, and permit dimming.

Performance Verification

There is no need for performance verification for this requirement. Typical plan checking and field inspection prior to framing will be adequate to verify compliance.

Cost Effectiveness

This requirement is cost effective and calculations will be performed in subsequent tasks to demonstrate this. For example, consider the following: Assume a home has 500 annual hours of lighting operation at \$0.15 per kWh for electricity. A compact fluorescent luminaire saves at least 65 Watts, as compared to a 100-Watt R or PAR lamp typically used in the 6" can, and produces the same amount of light. The homeowner saves about \$5 per year for each luminaire. If the cost premium is \$25/luminaire, the simple payback is about five years.

Analysis Tools

This requirement would be implemented as a mandatory measure and no analysis tools would be needed for compliance purposes. For cost effectiveness calculations, a simple "Energy = Power x Time" relationship will be used, coupled with data on typical lighting hours in residential applications, as well as power savings between conventional luminaires and those required by this measure. The benefits of reduced heat loss through the ceiling would be quantified using MICROPAS or CALRES.

Relationship to Other Measures

This measure is related to other high efficacy requirements for residential lighting.

Bibliography and Other Research

PNNL research on recessed compact fluorescent luminaires will be consulted. Apart from this, manufacturers specification sheets will provide power and cost data.